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ENGINEERING-EDUCATION

Bulletin of the
Society for the Promotion of Engineering Education

Vol. VIII LANCASTER, PA., SEPTEMBER, 1917 No. 1

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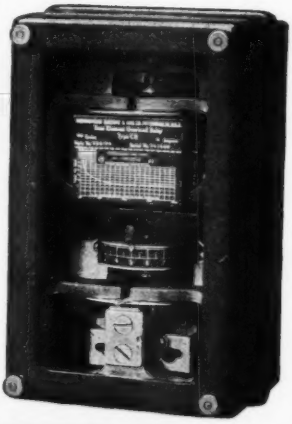

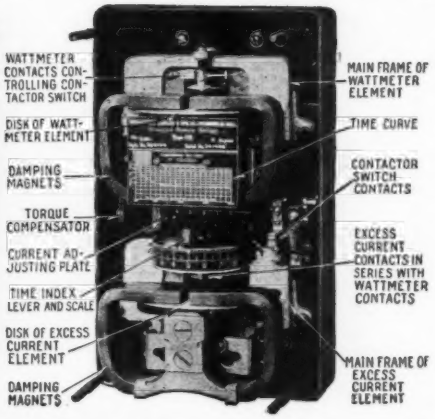
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BULLETIN

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PRELIMINARY REPORT OF A COMMITTEE APPOINTED BY THE ADVISORY COMMISSION OF THE COUNCIL OF NATIONAL DEFENSE TO STUDY THE RELATION OF THE ENGINEERING SCHOOLS TO THE NATIONAL GOVERNMENT DURING THE PRESENT EMERGENCY.

The undersigned constitute a committee appointed by Dr. Hollis Godfrey of the Advisory Commission of the Council of National Defense as a committee to study the relation of the engineering schools to the national government during the present emergency.

The committee assembled in Washington on August 7 and remained in session until August 10. It re-assembled for two days on August 31.

The committee has consulted with the heads of the various bureaus, divisions and departments of the Department of War and the Department of the Navy as to the probable needs for scientifically and technically trained men in connection with the military operations. It has held conferences with representatives of the Shipping Board, of the Department of Labor, the Federal Board for Vocational Education and the Bureau of Education.

The committee respectfully recommended to the Honorable Secretary of War as follows:

"That an engineer familiar with the equipment and the capacity of the higher technical institutions of the country be commissioned in the Army and assigned the task of coordinating the needs of the Army for technically trained men with existing educational facilities."

The committee's interview with the heads of divisions of the War Department showed that there were a few definite needs in the way of short course training which the technical

schools of the country might meet at once. A typical problem was presented by the Signal Corps which desired technical instruction for six depot companies, one for each army department, each depot company consisting of one hundred and seventy-five enlisted men. The committee found an institution equipped and ready to furnish this training in each of the departments and made the preliminary arrangements for the signal corps.

The committee also recommended to the Honorable Secretary of War that students and alumni of technical institutions who are drafted into the national army be assigned to branches of the service for which their special technical training fits them. It undertook to secure for the secretary lists of such students and alumni thus far drafted into the national service. These lists are being compiled and will shortly be sent to the secretary's office.

At the request of the Secretary of the Navy, the committee has compiled a list of engineering schools whose graduates may be considered eligible for competitive examination for appointment as acting ensign in the Navy for the performance of engineering duty only, in accordance with an Act of Congress approved August 29, 1916.

Just prior to the second meeting of the committee on August 31, the Secretary of War assigned an officer of the General Staff to study the problem of bringing together the needs of the War Department for technically trained men and securing the coöperation of educational institutions of the country toward meeting these needs. The committee has held profitable conferences with this officer. It proposes to keep in touch with him and to lend its aid as far as may be desired in the solution of this problem. While undoubtedly the necessities of the war will make desirable material changes in the curricula of enginering schools, it is at the present impossible to foresee what those changes will be. The committee is not prepared to recommend any fundamental changes in courses of study at the present time as the result of its inves-

tigation. It is of the opinion, however, that certain military engineering subjects may profitably be introduced as soon as possible. The introduction of such subjects will tend to satisfy the patriotic enthusiasm of engineering students. Moreover, those students who later go into the army will find these subjects useful. The committee has in mind particularly the following: Military bridge building, the laying out and sanitation of camps, the making and reading of maps, rapid reconnaissance, the laying out of trenches, etc.

It suggests that engineering schools endeavor to secure the textbooks used by the army in these and other military subjects. Application may be made to the Book Department of the Army Service Schools, Ft. Leavenworth, Kansas, for a complete list of these textbooks. The titles of textbooks used at the ordnance proving grounds can probably be obtained from the commandant of the proving ground, Sandy Hook, New Jersey. The committee would recommend as especially valuable for the information of engineering school teachers "The Engineer in War," by Major P. S. Bond.

The committee plans to issue a complete report as soon as possible. Meanwhile, it would be glad to furnish on request any information of which it has come into possession as the result of its investigation thus far. Communications should be addressed to the Secretary of the Committee, Dr. S. P. Capen, 516 Munsey Building, Washington, D. C.

Respectfully submitted.

F. L. Bishop,
C. S. Howe,
M. S. Ketchum,
C. R. Mann,
S. P. Capen.

THE PREPARATION OF ENGINEERING STUDENTS FOR ARMY SERVICE.

BY HENRY B. DATES,

Professor of Electrical Engineering, Case School of Applied Science.

The great demand of the government for technically trained men, not only for civil life but for military work, has brought forcibly to the attention of the faculties of engineering colleges the question of the preparation of their students for military engineering service. Large numbers of students of the engineering colleges have enlisted in various branches of the service, some are in officers' training camps, and undoubtedly the future will see many of the men now in college in the service of the government.

It is difficult, in these days of intense preparation, to learn, through the usual channels of information, the character of the training needed by our students for army service. The military departments of the government are so overburdened with work that it is not possible for them to give the attention to requests for information that they would like to do and they would do in normal times.

In order to study the question at first hand Case School of Applied Science appointed a committee of its faculty to visit some of the army posts at which officers' schools are located, in order to study, at first hand, the work given at these schools and to determine what changes in the courses of study might profitably be made so that the graduates of the college might be more efficiently prepared for the army service without detracting from their training for efficient engineering work in civil life. The committee visited the Military Academy at West Point, the Ordnance School of Application at Sandy Hook Proving Grounds, the Engineering College at Washington

Barracks, the Coast Artillery School at Fort Monroe, and the Army Service Schools at Fort Leavenworth.

It is a surprise, to one who has not followed up closely the education work of the army, to find how many excellent schools for officers have been established. Necessarily, at present, the work of these schools is more or less suspended because of the great demand for officers for the troops, but considerable work is still being done in the schools and that of a most interesting character.

The officers of the various posts visited, though overburdened with multitudinous duties in connection with the training of new troops, were courteous to the extreme, placing every facility at the disposal of the committee to study the work of their schools and giving freely of their time to make us thoroughly acquainted with the details of their courses and of their methods of instruction.

One was immediately impressed with the high character of the work and the thoroughness of the instruction. The civilian colleges may well profit by a study of the organization of the schools, the soundness of their methods of instruction, the extreme care taken in the planning of the courses of study and the uniformly high character of the work done.

With the exception of the Military Academy at West Point army colleges are practically postgraduate institutions to which each year a limited number of officers are detailed for a year's course of study. While at the college the officer's entire time is given to the educational work and he has no military duties whatsoever. With this arrangement of time, an exceptionally earnest body of students and the aid of the military discipline, a perfectly surprising amount of work is accomplished.

While much of this work, as would be expected, is of a strictly military nature, a very considerable amount is similar to engineering courses given in many of our civilian engineering colleges.

The courses are, in general, characterized by a very large

number of problems—many more than are usually given in our courses. The problems are excellently planned to emphasize fundamental principles and practical applications are continually made throughout the various courses. In fact, one is greatly impressed by the close association of theory with practice, on the principle that technical knowledge without the ability to apply the same is of questionable value. At most of the posts special buildings are provided for instructional purposes, the schools are manned by an enthusiastic body of officer instructors and well-equipped laboratories are provided.

The work of the Military Academy at West Point is more or less familiar to engineering teachers. It is interesting however to note, that here, as in other army schools, responsibility is placed directly on the students, not on the instructor; that emphasis is placed on the recitation, and that a student's standing is largely if not entirely dependent upon his daily work. The course of study includes mathematics, mechanics, chemistry, physics, elementary surveying, elementary electricity, elementary military engineering, together with other general subjects and much work of a military character. The engineering studies are not different in character and scope from those given in engineering colleges and it should be entirely practicable for colleges to give this work to all of their students.

The purpose of the Ordnance School of Application at Sandy Hook Proving Grounds is to train officers for the special work of the ordnance department such as the designing, testing, proving, and manufacturing of guns, explosives and ordnance material. Only commissioned officers who have had several years' service are detailed for this course and they are either graduates of West Point or of civilian engineering colleges. The course is two years in length—one spent in theoretical study at the Sandy Hook Proving Grounds and the following spent at the Watertown Arsenal, where instruction is given in shop work such as foundry, forging, machine tool work, and so forth, shop management, and strength of ma-

terials testing. The engineering work, as it touches the work of civilian colleges, comprises the chemistry of explosives, considerable work in electricity, and a small amount of steam engineering.

The Coast Artillery School at Fort Monroe in reality comprises two schools, one for Coast Artillery Officers and one for selected enlisted men. As stated in the annual report of the commandant the school has these objects in view:

(*a*) "To give all Coast Artillery Officers a year's systematic training in the technical duties of their profession—theoretical to cover the entire field, practical to cover the equipment supplied."

(*b*) "To educate and train specially selected enlisted men for the higher grades in the Coast Artillery non-commissioned staff."

The engineering work in the Officers' Division includes a course in electrical engineering, a short course in steam engineering, a course in submarine mining, which includes the applications of electricity to the art and work of civil engineering. Because of the very extensive applications of electricity in the Coast Artillery work much time is given to the course in electrical engineering. Some of the electrical subjects on which special emphasis is laid are switchboard and power distribution, testing cables and installations, fire control apparatus, installation and maintenance of submarine fire control cables, searchlight construction and operation and radio engineering. The tendency at this school is to still further expand the work in electrical engineering, to curtail the work in steam engineering and concentrate the mechanical engineering largely on the care and operation of oil and gas engines. To this end the course in internal combustion engines has been enlarged to include automobile engines, automobile equipment with the gradual abandonment of the work in steam. The courses of the school are most excellently arranged, the electrical laboratories are splendidly eqiupped and the standard is very high and compares favorably with that of the best en-

gineering colleges. The course does not take up the design of the electrical apparatus but gives a very thorough review of fundamentals and places great emphasis upon the applications of electricity in the Coast Defense Service.

The work in the enlisted men's division is divided into four courses: the artillery course, the electrical course, the clerical course and the radio course, all of which are of one year's duration except the radio course, which is finished in six months. The work of the enlisted men's school was of great interest, for though probably the larger part of the students had not had the equivalent of a high-school course much of the work that they were doing was fully equal to that of the first two years of college. Of course special emphasis is put upon the maintenance and operation of the apparatus and the applications to the special problems of the coast defense work, but a surprisingly large amount of theory is given and the fine results obtained are a splendid example of what can be done with a selected group of men under ideal conditions, splendidly planned courses of study, and intensified application.

Several distinct courses of study were found at the engineers' school for officers at Fort Leavenworth, Kansas. Some of these courses were distinctly military in character but in the department of engineering was found a very large amount of civil-engineering work applied to military requirements. In the army signal school at this post, splendid work is given in direct- and alternating-current machinery, storage batteries, telephone and telegraph lines as related to military service, radio telegraphy, and a general course in electrical engineering.

In general the army schools visited are splendidly organized and do work of the best character. Their courses of study are well planned and their methods of instruction such as civilian colleges may well build on to advantage. The efficiency of these schools is greatly aided by the military discipline and by the small sections handled—about ten men

per section—but the instruction is of the very highest character and one cannot but be impressed with the thoroughness of the courses and methods and by the results obtained. In the engineering work that is similar to that of the civilian colleges the daily recitation method is in use and little stress is laid on lectures.

The technical institutions of the country might profitably introduce into their courses of study work which will be of immediate value to the men in the army and which will at the same time be of value in civilian life. Many of our colleges already give to most of their students courses in elementary and topographical surveying and in electrical engineering.

If the elementary work in surveying were given in the freshman year, this course could be followed up in succeeding years by military sketching of the character given in the army schools, map reading and map problems, military bridges, practice in tying knots and lashings and a study of trench layouts. Field practice could be given in laying out trenches and in the erection of military bridges. It would seem desirable in the erection of bridges that the class should be handled as a military unit and the erection carried out with military dispatch, the speed to be emphasized and developed by competition between sections.

As regards electrical engineering, a year's course in direct- and alternating-current machinery is now given to many students in the junior year. This course could be readily planned to emphasize the distribution of power and the applications of electrical apparatus, and to include the elements of cable work and testing, searchlights, the principles of the telephone and telegraph and the application of other devices most commonly met with in army service.

Further expansion of the work could be made by giving a series of short courses in the senior year. The problems for the work of all courses should be drawn from army as well as from civilian practice. Laboratory work should be

made an important part of the course. The students should also have a course in internal combustion engines.

It would seem advisable for all students, irrespective of the particular branch of engineering in which they intend to specialize, to have both the civil and electrical engineering work.

It is very probable that we shall see in the future many graduates of civilian colleges taking up the army service for a career and it is believed that the engineering colleges will find by a careful study of the problem, that changes can be made in their present courses of study which, without decreasing the efficiency of the training for civilian engineering, will better fit their students for the problems of the army service.

COOPERATIVE PLAN OF ENGINEERING EDUCATION.

BY J. W. W. HALLOCK,

Director, Coöperative Work, University of Pittsburgh.

The school of engineering of the University of Pittsburgh is endeavoring to train men capable of filling executive positions in engineering industries. To accomplish this aim requires that each student shall receive a maximum amount of practical experience in the branches of the industries for which he displays the greatest aptitude and liking. It requires further that he shall have a broad perspective of engineering work and a working knowledge of the principles of industrial management, shop organization, plant layout, etc., as well as thorough knowledge of engineering. Situated as it is in the greatest industrial center of the world, the University of Pittsburgh is in the best possible position to assist in the training of such men. The demand for men possessing such training cannot be questioned and it remains for us to give to engineering students, preferably during their college course, the broad experience and breadth of view necessary in executive work. It is desired to herein describe the plan which has been a great factor in accomplishing this aim at the University of Pittsburgh, namely the coöperative plan of engineering education.

Briefly the operation of the plan is as follows.

The freshman and senior years are spent entirely in classroom and laboratory work. The sophomore and junior years, which are divided into three month terms, are spent alternating between classroom and the shop. At the close of the freshman year the class is divided into two equal sections; one of these sections remains in school for the summer term;

the second section is assigned to coöperative work for the summer term. In the fall term the section that has been on coöperative work returns to school and the positions thus vacated are filled by assignments from the section remaining in school. The two sections alternate regularly every three months until the beginning of the senior year with the exception that all students are required to be in school during the summer ending the sophomore year. The following diagram will illustrate this arrangement.

One fact to be noted here is that all students in engineering in the University of Pittsburgh are required to do coöperative work. Thus any students having the desire to secure an engineering education with a minimum of personal effort are automatically excluded.

The arrangement of three month periods spent alternately in school and on coöperative work is ideal for a four-term plan. Beginning with the fall term the alternations fall approximately in the Christmas and spring vacations and at the beginning of the usual summer vacation. This is an excellent time to make the necessary changes in the shop positions. The firms offering coöperation with the school are practically unanimous in the opinion that the three-month period spent in the shop is the most efficient from their standpoint, as it permits them to arrange a larger variety of work for each engineering student without any sacrifice in the usefulness of such services to the firm. It also enables the employer to have a longer continuous period over which to observe the fitness of any one student for the work in hand. Incidentally the number of terms of work to be repeated in the classroom and laboratory is kept at a minimum. As will be observed from the above diagram it is necessary to repeat only four terms, one year of repeated work in four years. The amount of theory given in any course is not reduced by having five terms instead of six during the sophomore and junior years, as the five terms spent in school contain the same required amount of work as is originally contained in two full years.

The freshman year which is spent entirely in classroom and laboratory work permits a close study of the individual student before any definite assignment is made to coöperative work. The director of coöperative work, who is also freshman advisor and instructor in elementary shop work, is in constant and intimate contact with every member of the freshman class. This permits a careful study of the fitness of each student for engineering work. Too often a student is led to taking up engineering work by the misguided advice of family or friends without due regard to his aptness or liking for such work. Many students whose efforts are thus misguided are frequently guided into a more congenial line of work, resulting ultimately in more substantial and rapid advancement to them.

During the freshman year, the subjects taken by all engineering students are identical. Near the close of the year, lectures are delivered by the heads of the different departments and by outside speakers, the object of these lectures being to familiarize the student with the usual scope of work in any of the branches of the profession. Guided by these lectures and by the director of coöperative work, each student makes a selection of the branch of engineering he elects to follow. By this time, the director has a fairly comprehensive set of notes on the general characteristics of every freshman. The conclusions reached are carefully checked with similar estimates from all freshman instructors and the heads of the departments in which such students have worked. Any discrepancies or wide variations in estimate are again checked to make the records as accurate as possible. As an aid to making these estimates the following form was devised:

Each freshman is required to fill out one of these forms. Knowing the amount of time ordinarily required for the preparation and attendance on classroom and laboratory work, a close estimate of the time available for recreation may be made. The statements of how a student spends this spare time give a fair indication of each student's earnestness of

purpose in securing his professional training. For example, one student indicated on the above form that he attended a theater "at least three afternoons a week." From this student's schedule, it was seen that only two afternoons were available each week. Investigation showed a systematic failure to attend classes on one or more afternoons. In this case, calling such neglect to the student's attention did not produce the desired result and a failure in the first semester's work was the natural consequence.

From the very beginning of a student's course, a study is made of the phase of engineering work to which he seems best adapted; that is, whether operating, manufacturing or designing. The classroom readily lends itself to such a study if classes are small, but the practical coöperative work greatly facilitates it. In this, also, the coöperating firms have rendered valuable aid, both in assisting in such study and in changing the student's work to fit his growth in it. It must not be thought, however, that a student's work is changed at every expression of dislike or dissatisfaction. In cases where objection is made to the character of the work, the stduent is led to see the importance of a familiarity with the work in hand and with the work that may be observed going on about him. No effort is made to fit each student to the particular job assigned. The job is rather used as a means of familiarizing the student with that particular phase of engineering work, and he is constantly being shown the relation of that particular work to the whole plant in question.

With proper coöperation, therefore, the plan may be the means of the more rapidly and easily leading the student into congenial and profitable work.

It may be argued that the study mentioned above leads to unwarranted specialization at a time when general facts only should be observed. It will be noted, however, that the divisions mentioned, operating, manufacturing and designing, are very general. Only in very special cases is such a study permitted to become highly specialized. A student who dis-

plays a marked interest in operating work may be assigned for his first term to a power plant. Here his work may be as helper to the switchboard attendant. When visited by the director of coöperative work, points of interest regarding coal and ash handling apparatus, boiler settings, methods of cleaning, etc., are observed and discussed. During later terms, the question of power-plant economies, steam consumption, power costs, etc., may be taken up intelligently and profitably. All of the coöperating firms urge the students to ask questions, take notes and make sketches. Similarly students in each of the other lines indicated are led to look into all departments and to see the relation of each to the other.

Soon after a student is assigned to coöperative work he is furnished an outline of general points of interest to be observed. These outlines are prepared by the director of cooperative work with the assistance and suggestions of officials of coöperating firms. Outlines for first terms of work are necessarily rather general, as the student has had no real engineering theory. During later work, however, these outlines may be made more specific and the points indicated are usually a little in advance of the theory the student has had. Thus he is led to anticipate the principal points of the theory. An example of a very general outline is given on page —. It may easily be seen how such an outline may be enlarged and developed.

A. Location and territory served.

B. Organization of executive force.

C. Details of plant layout and operation.

1. Coal and ash handling apparatus.
   - (*a*) Type.
   - (*b*) Power consumed.
   - (*c*) Efficiency in operation.
2. Stockers.
   - (*a*) Type and make.
   - (*b*) Method of driving.

(*c*) Regulation of speed.
(*d*) Requirements as to grade of fuel.

3. Boilers.
   (*a*) Arrangement in plant.
   (*b*) Type and horse-power.
   (*c*) Method of cleaning.
   (*d*) Arrangement of baffles.
   (*e*) Average evaporation per pound of fuel.
4. Engines.
   (*a*) Condensing or non-condensing.
   (*b*) Size of power.
   (*c*) Types of valves and governing.
5. Generators.
6. Switchboards.
   (*a*) Generator panels.
   (*b*) Distributing panels.

D. Observations on conditions conducive to health of employees.
1. Heating and ventilation.
2. Illumination.
3. Toilet facilities.

E. Observation on skilled and unskilled labor employed.
1. Comparison of American and Foreign
   (*a*) Religious and social views.
   (*b*) Attitude toward work, etc.
2. Capacity for development in the work.

During a student's employment on coöperative work, he is considered an employee of the firm and as such observes shop hours, receives regular wages, and is subject to all the restrictions and privileges of the men with whom he is working. The wages paid coöperative students varies with the nature of the work and with the degree of advancement of the student in his course. On some of the railroad work, the rate of pay is as low as 18 cents per hour, while for some of the more advanced work it is 30 cents. It is to be noted that these figures compare favorably with those applying on

graduate engineer apprentice courses. It is customary for a student to receive about $450 in wages during his entire coöperative work. This offers a distinct money advantage to students taking engineering courses under the coöperative plan. As indicated above the director of coöperative work visits each student at regular intervals. Usually from an hour to two hours is spent with each student, depending on the nature of his work and the amount of interruption advisable. The outlines discussed above form an excellent basis for discussion and questioning. Opportunity is also afforded for still further study of the plant by the director, and for discussion of the progress of the student and the work with foremen and superintendents. The visits by the director are supplemented by bi-weekly reports in person to the university. Here are discussed in the presence of other students the special interest regarding each job. All the students from any one department thereby profit by this interchange of ideas.

At the close of each term of coöperative work, the student is required to submit a written report covering the work done. These reports must be satisfactory before credit is allowed for the work.* Reports are also received from foremen and superintendents under whom the student has worked. These reports are brief, but form a good basis on which to arrange future work and serve as a fair estimate of a student's development in the work. The following is the form of report:

UNIVERSITY OF PITTSBURGH.

REPORT ON COÖPERATIVE STUDENT.

Name .....
Check No. .....Department.....
Date student began work .....
Date left .....

* Frequently they contain original observations or suggestions for the improvement of the work and when brought to the attention of the officials of the firm their adoption follows.

No. days actually worked .....
Please rate on the following: .....
Ability ..... Reliability.....
Industry ..... Initiative.....
Tact .....
(Rate as "Good," "Average," or "Poor.")
Remarks: .....
.....
.....
Sign here .....
Position .....
Date .....

While progress in arranging coöperative positions for students was at first slow, the list of firms offering to employ students shows a tendency to grow faster than the supply of men. The following list of firms will give an indication of the variety of work offered:

Duquesne Steel Foundry.
Duquesne Steel Works.
Douglass & McKnight, Civil Engineers.
John F. Casey Contracting Co.
Farris Engineering Co.
Hope Engineering and Supply Co.
Lewis Foundry & Machine Co.
Mesta Machine Co.
McClintic-Marshall Construction Co.
National Tube Co.
Pennsylvania Railroad Co.
Pittsburgh Steel Co.
Pittsburgh Transformer Co.
Pennsylvania State Dept. of Health.
Oliver Power Plant.
H. K. Porter Plant.
Riter-Conley Mfg. Co.
Pressed Steel Car Co.
Union Switch & Signal Co.
United States Engineers Office.
Westinghouse Electric & Mfg. Co.
Carnegie Institute and Library.
National Malleable Steel Castings Co.
Pittsburgh Railways Co.
Republic Chemical Co.
Atlantic Refining Co.
Bessemer & Lake Erie R. R.
Duquesne Light Co.
Pittsburgh & Lake Erie R. R.
Bell Telephone Co.
Pittsburgh Valve Foundry & Construction Co.
Collins, Gordon Contracting Co.
Pittsburgh Construction Co.
A. M. Byers Co.
Fort Pitt Bridge Works.
Pittsburgh Coal Co.
American Bridge Co.
Aluminum Company of America.
Harrop, Hopkins & Taylor.
H. Koppers Co.
W. G. Wilkins Co.
Pennsylvania State Highway Dept.
Allegheny County Engineer.

City of Pittsburgh, Bureau of Engineering.	General Electric Company.
City of Pittsburgh, Dept. of Public Health.	R. W. Hunt & Co.
	Blum, Weldin & Co.

One of the objections which the coöperative plan was designed to overcome is the increasing tendency to require engineering graduates to serve a special apprenticeship before entering the engineering department or being absorbed into the executive work. The establishment of such apprentice courses, while not necessarily signifying any lack of training in the essentials of engineering theory, at least implies the necessity for practical training. If then, as is frequently the case, a student is preparing for work with some certain firm, it may be possible to adapt the coöperative plan to such apprentice courses. At the University of Pittsburgh this is the case. For instance, students planning to enter the engineering apprentice course at the Westinghouse Electric & Manufacturing Company may enter the course at the beginning of their third coöperative term, thus securing six full months credit on the course before their graduation from the university. The Pittsburgh Railways Company offers the same opportunity to students of the university. The fact that these companies continue the arrangement, and the employment of such students after graduation is another testimonial of the success of the plan.

With some firms, the importance of having a systematic plan of advancing the students through the plant is not apparent. In such cases, the suggestion of a plan by the director of coöperative work leads to the adoption of a regular and progressive plan. In other cases, such as the shops of the Pittsburgh Railways Company above mentioned, as well-organized routine already exists. In the case of the railways company, each of the following departments is served:

Repairing	Motor and truck	Stoves
Winding	Machine	Operating (or barns)
Wiring	Drafting	

Transfer from one department to another is affected by the railways company officials, but it is customary for undergraduate students to serve one whole term in each of the above departments. In this case it is impossible to complete the cycle of departments during the university course. Work is done in each of the other mentioned departments after graduation, however, and the practical work preparatory to engineering or executive work is the sooner completed.

Many instances might be cited to illustrate the development of students by reason of the practical experience obtained on coöperative work. For instance, one student was recently placed with the Lewis Foundry and Machine Co., manufacturers of rolling-mill machinery. His work was in the metallurgists' laboratory and consisted in the analysis of samples of cast iron, coal, slag, etc. He displayed such an interest in the work and made so many investigations of the physical differences of the various grades of the product that his research—done on his own time—was the basis of many improvements at the plant. To-day he is a near-authority on the metallurgy of iron and steel. Another student, engaged with a Pittsburgh machinery company, devised a special chuck for lathe use and an ingenious centering device for lathe work —two thing which have since resulted in enormous savings to the firm by whom he was employed. These two students will unquestionably be sought after graduation.

On the other hand, of course, many instances might be quoted showing the failure of students to grasp the opportunity offered by the coöperative plan and the distaste for the kind of work given. One student engaged on the fabrication of structural steel shapes telephoned the director of cooperative work (after having been on the work two weeks) that the work was hard and dirty and that the rest of his gang were foreigners and he couldn't understand them. He was advised that any engineering work was hard, that soap is cheap, that he had an excellent chance to study an additional modern language, and that if he was not gang leader in one

month he need not return to school. The result was that he completed the term with credit to himself and the work and is today one of the best all-round engineering students. Another student was indignant on being told that his work was not satisfactory as he said he had been "on the job every day." He failed to see the value of the practical work, and displayed so fiery a temper that an interview with his father was necessary. The interview showed that he had none of his father's temper, as none of the latter's seemed to be missing. However, the father was convinced of the advisability of his son's taking a broader view of the work. At this writing it is too early to predict the outcome of this case, but it is altogether possible that this student may yet develop into a master engineer.

About two years ago, a coöperative student was employed by a bridge company on field work. During his last term he was in charge of the construction of a bridge in West Virginia. During his senior year he was employed by the company in all of his spare time. Before commencement he was sent by them to a new job, which he was expected to carry out after graduation. His services were considered so valuable that he was allowed only half a day from his work to attend the commencement exercises and receive his diploma.

The coöperative plan of engineering education has been in effect at the University of Pittsburgh for almost seven years. In order to ascertain the attitude of alumni toward the plan, questionnaires were recently addressed to them. Replies were received from seventy per cent. of those addressed. The attitude of these men may therefore be taken as representative. The following were the questions asked:

1. Did the experience you obtained in the coöperative work apply directly on the work you took up after graduation?

2*a*. Do you feel that your first position after graduation was a more responsible one than you might have obtained without coöperative work?

2*b*. Have you ever been informed as to this point by any other man under whom or with whom you have worked?

3*a*. Was the salary on your first position after graduation higher than it would have been without your coöperative experience?

3*b*. Have you ever been so informed by any official of the firm?

4. Does your advancement along engineering lines seem more or less rapid and substantial than other engineers in the same company who did not receive coöperative work?

Question Number	Per Cent. Answered Yes	Per Cent. Answered No	Per Cent. Noncommital	Per Cent. Not Replying
1	76.5	21	2.5	0
2*a*	47	48	5	0
2*b*	28	67	0	5
b3*a*	50	50	0	0
3*b*	19	76	0	5
4	55	8	37	

It is interesting to note that more than two thirds of these alumni accepted positions after graduation in the line of work followed on the major part of their coöperative work. This is due to the fact that many graduates are naturally employed by the same firms who employed them on coöperative work.

Only about half of these men considered their work immediately after graduation to be more responsible than it would have been without coöperative work. This is no doubt due to the fact that the men grow in capacity for such work and, therefore, feel that they are capable of assuming greater responsibility. It is natural that the percentages of replies to questions 2*a* and 3*a* should be about the same, the increased salary being due to the added responsibility.

The disadvantages of the coöperative plan are few but apparent. First, the employment of the plan necessitates a certain amount of repeated classroom and laboratory work. The

* Of the men who did not commit themselves one way or the other all but 4.5 per cent. explained that they had been out of school too short a time to make observations on this point.

extent of this repetition depends largely on the length of alternating periods on coöperative work and in school. The three-months term seems to lend itself to greater flexibility and permits a student to complete any one subject before leaving the classroom for the shop. Second, the executive details when such a plan is in force are more difficult. Third, a student's steady progress in theory may be said to be somewhat interrupted, but these interruptions are less serious in three-months periods than in shorter periods. Finelly, there is always the danger that a depression in business will result in the discontinuance of coöperation by some firms.

It is believed that these disadvantages are more than offset by the immense advantages and great opportunities set forth above. Summing up, the advantages might be stated as these:

1. In the usual engineering courses the objection is frequently made that a student receives no real engineering work until his junior or senior year.

NOTES ON THE TEACHING OF SINGLE-STROKE FREEHAND LETTERING.

BY RICHARD S. KIRBY,

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Since the introduction of Reinhardt's system, in 1895, the importance of the systematic teaching of single-stroke freehand lettering as an integral part of a course in mechanical drawing has gradually come to be generally appreciated. The five most widely used texts on mechanical drawing published during the past half-dozen years devote on an average 21 pages each, or ten per cent. of their space, to freehand lettering; of these books, one devotes only 4 pages out of 141—another 50 out of 277.

The following observations on the teaching of single-stroke lettering to engineering students are the result of the author's experience with beginners, both in classroom and drafting room.

1. Lettering should be taught as such—the art cannot be unconsciously absorbed overnight.

2. A student is interested in a subject in which his advance in proficiency can readily be shown him.

3. Lettering drill should be administered in homeopathic doses repeated at frequent intervals; a long assignment is tiring to the hand, the eye and the mind.

4. For a novice to attempt lettering practice without the use of top and bottom guide lines and slope lines is largely time wasted.

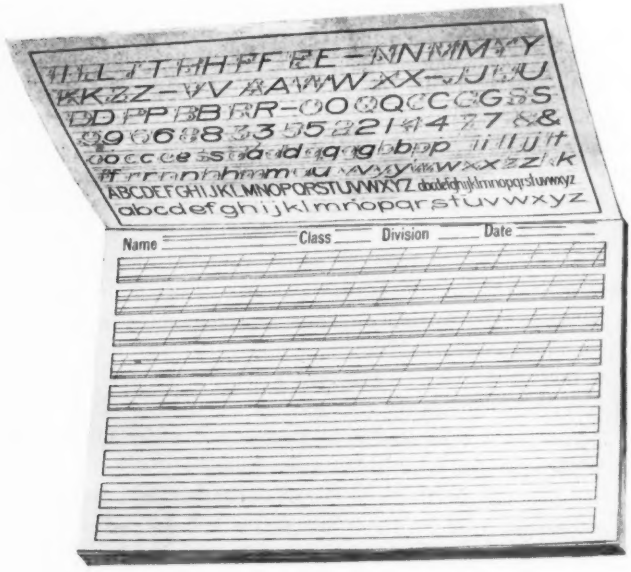
5. Inclined letters are formed more naturally than vertical letters and should therefore be taken up first.

6. Pencil work should precede that with pen and ink, and

should be continued until both the form of each letter and the order and direction of its strokes have been mastered.

7. The letters should be studied in family groups, each drill period prefaced by a discussion of the points of resemblance and dissimilarity between the letters of the group.

8. The spacing of single letters should at first be treated as of no consequence; only after thorough drill on the separate letters should they be grouped into words and finally into sentences.



9. The most effective personal criticism is that given during the lettering period, before the work has grown cold.

In his endeavor to simplify the teaching of lettering the author has evolved the little tablet shown in the accompanying illustration. The tablet is designed to save time which the

student otherwise would spend in ruling guide lines. Moreover, his copy must perforce be within a few inches of the letters he is attempting to execute. Certain advantages accrue to the instructor as well, such as elasticity of system, and convenience in checking and filing.

The tablet is 5 inches by 8 inches, with the longer dimension horizontal, and it is bound at the top. It contains 30 sheets of heavy ledger paper stiff enough to file vertically—each sheet ruled, in yellow, for 9 rows of letters. Horizontal guide lines provide for several heights of letters, and slope lines (at $63\frac{1}{2}$ degrees, or 1 to 2) are drawn for the first 5 rows. There is a heavy manila cover, on the inside of which is printed, in black, a capital and a lower case alphabet of single-stroke letters, with the sequence and direction of the strokes noted; also several alphabets of vertical letters.

At the Sheffield Scientific School, 8 to 10 hours during freshman year are devoted by the average engineering student to single-stroke freehand lettering. Drill is provided for at weekly intervals throughout the year, using the first twenty minutes of one drawing period out of three. A series of about 25 progressive exercises is scheduled for the year, beginning with Exercise No. 1, which is a study of the lower-case letters o, c, e and s. Review exercises are inserted at suitable intervals. The last 8 exercises consist each of a group of words or phrases peculiar to the vocabulary of a single engineering field.

Mimeographed slips are used in prescribing the letters or words which constitute a day's assignment, with the size of the letters. The cards are collected after each day's work, and are filed in such way as to exhibit the progress of each student for the entire term almost at a glance. This system reduces the routine work of the instructor with a large class to a minimum and enables him to concentrate his attention on the business of constructive criticism of the work of his students.

EDUCATION VERSUS ENGINEERING.

BY ABRAHAM PRESS,

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The first impulse would be to deny that there could be anything antithetical in the desires of educators and the employing engineers. As a matter of fact the ideal of the employer is to obtain the best professional service for the least monetary outlay. It is difficult to believe that the hard headed business man can see any monetary worth in "cultural" proclivities. True, that engineering employers know that what is called "breadth" in the outlook on life is necessary for the executive side of an engineering undertaking. Here however the important feature is that indefinable something that has an almost machiavellian characteristic. Some may call it tact, others perhaps the skill to hoodwink an unsophisticated subordinate. One thing is certain, it does not represent what educators imply by the broad cultural outlook on life.

The ideal of the educator, it is safe to say, is in developing a proficient engineer also versed in the humanities. Some of these humanities are very often of such a nature as to "unsettle" the minds of the underpaid technician. Already there is considerable social unrest. To train a would-be analytical mind so that he should be in a position to appreciate the modern problem drama, or develop a taste for the new emotional tendencies in art, would not represent efficiency from a works standpoint without our employers also being willing to acquire education along these lines. If, on the other hand, it is thought that such material can be made to be satisfied with humanities along purely classical lines, then the results both as to technics and the humanities must remain as they are in fact to-day. It would be better to entirely divorce the two.

However, it is not enough to teach dry technics without at the same time inculcating a spirit of cultural devotion to an ideal. To hold forth to the student the one single thought that he is to study engineering because "it pays" is to be false to the ideal of every true educator. To hold freshmen conferences in which the heads of the engineering departments vie with the arts and science departments, and with each other, in misrepresenting the wonderful money-making possibilities of their professions is a scandal nauseating to the highest degree.

Curricula based on the money ideal alone cannot turn out engineers capable of holding their own in the world's commerce. Competition to get large attendances strikes at the very foundation of the national life. It makes for poor earlier training, and what is worse, poor scholarship leading to the degrees. Indeed the evil is so great that about the worst thing a real student can do is to attend almost any of the technical schools—certainly any of the newer ones in which it is professedly the purpose to obtain a record as to numbers.

There is also a short-sighted policy from a national standpoint which the English engineering firms are beginning to take to heart. It is that poor wages make for disinterestedness and lack of scholarship in those doomed to work at less than artisan's wages. It reflects in very much the same way in the teaching profession, since, as Dr. Drysdale confessed, the higher positions were invariably filled and held by those individuals whose mental make up was directed to worming their way as early as possible into the higher positions of executiveness rather than to those of scholarship.

It would appear to be futile to discuss promoting engineering education when a man's scholarship is about the last thing thought of as fitting him for his position. As one president of a university admitted, he was not interested as to how much time or scholarship was devoted to the work of the classes to be held, as he was that first, the students should be made to believe that they were "getting by with it," and secondly, that

the teacher was able "to get away with it." What madness it is to talk of scholarship under such conditions. To whom shall one appeal when presidents talk like the above and deans obtain their posts by pure seniority, even when incapable of talking a very simple English, or when engineering instructors and professors without engineering experience are selected for cheapness and youthfulness.

Surely a committee of the Society for the Promotion of Engineering Education ought to be formed where complaints of the above type can be lodged with the understanding that if authenticated such conditions should be "hall-marked," so that the engineering industries of the country shall not suffer and the schools in good standing profit thereby.

It is notorious that many real students begin their real education only after leaving school. The mathematics, physics and chemistry are very often of the most slipshod and unrelated character. Only that type of student can make good culturally when left free to choose the electives that dire necessity after school has taught him are most important. It is difficult to see how mathematics can be taught properly at the technical schools when there is no attempt of choosing mathematical teachers for their engineering experience. Where are the advertisements to this effect? It is difficult to turn out properly trained engineers when the teachers of physics and of chemistry are not expected to have had actual engineering experience. Where are the advertisements to this effect, and what effort is made to draw such prospective teachers away from industry?

As a matter of fact till the time arrives when the appointments and the promotions in our engineering colleges will be made strictly on a basis of actual engineering experience, published research, as well as "getting by with it" with the student body, there is little hope for the avoidance of such cataclysms as we are now witnessing—at least such is the opinion of educators to-day in Great Britain and has been the opinion of the writer for the last fifteen years.

CLASSROOM ADMINISTRATION.

BY M. L. FISHER,

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The instructor who goes into a classroom has two functions to perform: first, to impart information; second, to maintain discipline. In college classes the second ought to be of minor consequence. However, it frequently happens that college classes are much in need of discipline.

Information is imparted in three general ways: first, by lecture; second, by means of textbooks and quizzing; and third, by demonstrations. The giving of instruction by lecturing is one of the most common methods in colleges and universities. It cannot be said that this method is entirely popular with students; many men who have ability are poor lecturers. When lectures are given, for which students are to be held responsible for the information imparted, time should be given for jotting down the important statements. The statements should be concise, brief, and to the point, and these should be followed by elucidation of the facts or principles involved. It is not desirable to give undergraduate students lectures in which note-taking is not required, for they have not reached sufficient maturity to appreciate the value of the material. Also, the act of note-taking impresses the fact upon the minds of the students. The use of a textbook is probably the best method of imparting instruction along those lines of work where the principles and facts have been pretty well worked out. Where students are required to purchase a text, the text should be thoroughly studied and mastered. To require students to purchase a text and then continue lecturing on the subject matter of the text is equivalent to the instructor saying that he can present the subject matter in clearer form than the author has written it, and that

the students have been required to buy the textbook in order to compliment its author. The first condition is one that the instructor ought not to admit, and the second is not worthy of him. Having required the student to purchase a text he should be held responsible for its contents, both in oral and written quizzes. These quizzes should be rigid and exact. Questions asked should be such as to require the student to give definite, concise statements. Students need to practice more than they do the expression of their knowledge in exact statements. Some phases of instruction are best given by means of demonstrations. When this is done all details of the operation should be visible to the student and it is a rare class in which every member will get the same idea from one performance of a demonstration. The repetition of a demonstration serves to clear up doubtful points in the minds of the various members of the class; in some cases several repetitions are needed. A great deal of the effectiveness of a demonstration depends upon the ability of the instructor to express himself clearly and definitely.

The preparation of the instructor is largely responsible for the success of his work. The instructor should master the subject matter so that he can go before his class and not be confined to his notes or text. If he is giving lectures he should be able to stand out in front of his class and present the facts and principles of a subject in an offhand manner. It is helpful to the student if the instructor outlines his lecture on the blackboard as he proceeds. The lecture should be so arranged and organized that it proceeds logically in all of its parts. In quizzing a class the instructor should be able to ask his questions in a running-fire method and not have to refer to the text to find out what the next question is to be; he should have determined beforehand the principal questions to be asked on the assignment. Out of the answers will grow a great many other questions to be asked on the spur of the moment. Students should be required to give

clear, intelligible answers or explanations. The instructor should insist on clearness and conciseness of statements.

Among the items of discipline that we have to consider are punctuality, decorum, and attitude. Among college students punctuality is one of the big problems. Instructors secure this in different ways; some have penalties for tardiness or absence; others secure punctuality by showing the student the importance of the habits of punctuality and regularity. Students who are habitually late to class and irregular in their attendance are likely to conduct their own business affairs in the same way and such habits carried into employment cause the individual soon to lose his place.

The instructor is largely responsible for the decorum of a classroom. He must himself be calm and self-possessed. Any nervousness on his part is contagious. A fidgety or noisy instructor has the same kind of a class. Some instructors in lecturing address their classes in a voice loud enough to attract the attention of a campmeeting. The tidiness and orderly arrangement of a room has much to do with good deportment on the part of the pupils. A room strewn with scraps of paper, and chairs out of line does not induce orderly habits on the part of students. If each student is assigned a particular seat, pushing and crowding for the best seats will be obviated. The instructor should call attention to boisterous conduct on the part of his pupils. They should understand that rowdyism is entirely out of place within college walls.

The efficiency of the instructor is greatly affected by the attitude of the student. The student who lounges in his seat is likely to be sluggish and careless in his thought. He is not likely to think clearly or accurately. When called upon to recite he should stand erect and speak in a proper tone of voice, distinctly and concisely. Accurate expression should be sought for on the part of the instructor. Undue levity between instructor and student in the classroom is not desirable. However, no instructor should assume a superior air

in the presence of his pupils. A natural, normal manner before a class puts them at ease and obtains the best response they are capable of giving. An instructor should place confidence in the honesty of his students. Suspiciousness on the part of the instructor is always rewarded by cheating on the part of the students. The instructor should seek to have his students realize that cribbing is a crime. A student who does crooked work in the classroom will not be above doing dishonest things in the business world, if the situation seems to demand it.

Perhaps no branch of educational work is so little supervised as that done in colleges. The different schools and departments should be closely supervised by the president of the institution. Heads of departments and divisions should see that the work of their assistants is carefully and properly done. The young instructor should have sympathetic advice and direction by his division head. Many young instructors fail in their work because they have not been properly placed, or advised, in their work. The heads of the departments should see that various courses are well coördinated and articulated. Each course of instruction should connect with the courses which have gone before and those which are to come. For many students the bridging of the gulf between the high school and the freshman work in college is more than they can accomplish and the result is failure in their freshman work. It is the duty of the heads of schools, deans, and president to provide proper facilities for instruction and to see that these facilities are used. Careful choice should be made of instructors and there should be frequent consulting and advising with those in charge of distinct lines of work. Deans and the president ought to get in close contact with individual instructors, see that all are carefully related to each other and that the work goes forward without a hitch or a break.

DO THE NATIONAL ENGINEERING SOCIETIES DISCREDIT ENGINEERING EDUCATION?

BY J. R. BENTON,

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Of course the answer is "No." Yet there are some particulars (the discussion of which forms the purpose of this note) which might seem to call for an affirmative answer if they formed the whole evidence on this question.

The national engineering societies admit to membership only such persons as have had professional experience of specified amount. They have no educational requirements as such. For admission the only recognition they give to technical education is as a substitute for a certain amount of practical experience. As such they do not seem to rate technical education very highly. The American Society of Civil Engineers in its constitution (Article II, Section 2) specifies that "*graduation* from a school of engineering of recognized reputation shall be considered as equivalent to *two years active practise.*" The American Institute of Electrical Engineers in its constitution (Article II, Section 7) specifies that "*graduation* from the electrical course of a school of engineering of recognized standing shall be considered as equivalent of *one year's electrical experience.*" The American Society of Mechanical Engineers in its constitution (C9) specifies that "*graduation* from a school of engineering of recognized standing shall be considered as equivalent to *two years* of active practise." The Western Society of Engineers in its constitution (Article III, Section 8) specifies that "*graduation* from an engineering school of recognized standing shall be counted as *two years* of active practise." The same sort of provision exists in the constitutions of many of the local engineering associations (Loui-

siana Engineering Society, Florida Engineering Society, etc.), into which they have undoubtedly come by copying from the national societies.

Presumably the low recognition accorded to engineering study as compared with actual practise has arisen from the well-known and unchallenged fact that a raw technical graduate is not at first as useful as a young man who has spent as much time in actual practise as the graduate has spent in study. Nobody questions this fact; although one may well question whether, ten years later, the graduate is not then better qualified by more than the one or two years, to which the engineering societies count his graduation as equivalent.

The situation would not be so bad if the constitutions of the societies were drawn so that the technical graduate would be recognized as only two years behind his schoolmate of the preparatory school who has apprenticed himself in engineering without going to college. But this is not the case. The non-graduate engineer may have started into practical work before having obtained anywhere near the education which would even admit him to the freshman class of a reputable engineering school. Take the case of two boys about to enter high school. Let one take a job as a chainman on a survey party and work up from that. If he has native ability and determination to master the principles of his work and continues in it for five years, and then succeeds in getting into responsible charge of some construction work for a year more, he will have met the requirements—as far as experience is concerned—of an associate member in the American Society of Civil Engineers. Let the other boy complete his education. This will mean four years in the high school and then four years more in college. When he graduates he may find that his old schoolfellow has been an associate member of the A. S. C. E. for two years, and the same society will not admit the technical graduate to the same grade of membership without making him wait for *four years longer*. That is, with the same starting point it takes the better educated man just twice as long to

obtain equal recognition from the society as the less educated one.

If the standards of engineering societies are to be fixed solely and absolutely by purely technical accomplishments, undoubtedly the societies are right in this sort of apparent discrimination against college men. Of late, however, there has been much disposition to insist that engineers should be men of breadth of view—which in most cases means men of some general education. There has been a feeling that engineering as a profession has not received the popular respect and recognition which it ought to have; and one of the commonest explanations proposed is that too many engineers whose competence in their own line is beyond question are lacking in that breadth of education which is usually possessed by other professional men.

If this is correct, and if the engineering societies are to stand for whatever raises the standing of the profession, then they ought to give better recognition to educational qualifications. This need not involve letting down the bars to inexperienced college graduates; the requirements could be left the same for them as in the past, but the amount of experience required of the non-graduate could be increased in proportion to the time when he has left school. In our imagined case of the two boys, the one who did not complete his education would be required to show twelve years of total experience instead of just six as at present.

A change in this direction would not be a discrimination against the man of native ability who has not had opportunities for formal instruction but has educated himself by his own efforts—a man who certainly deserves to be honored and who usually exceeds the average college graduate in force of character. Such a man would not have to wait any longer to receive recognition than if he had gone to college. The proposed change would merely mean that discrimination was not made *against the college-trained man,* as at present.

As a matter of fact I do not believe the provisions from the

constitutions of the societies which have just been cited really represent any definitely-intended policy at the present day whatever. All the other societies have simply copied from the American Society of Civil Engineers which was founded in 1852, its present constitution being adopted in 1891. At the time of the foundation of the American Society of Civil Engineers, the engineering schools of this country were nothing like as well developed as at this time, nor was it as common for those who wished to become engineers to prepare themselves in college. Even since 1891, the time of adoption of the present constitution, there has been great advance in the character of instruction in the engineering colleges, as well as in the extent to which they are used by prospective engineers.

Yet recognition on the part of the engineering societies of these changed conditions has not been made. Meanwhile some states are passing laws to regulate admission to the practice of professional engineering. Requirements for admission to practice are very naturally based on those for admission to membership in national engineering societies. So the—presumably unintentional—discrimination against the college-trained engineer is spreading. It is high time that the national engineering societies revise their constitutions and adopt a twentieth-century attitude towards engineering education in their admission requirements.

ITEMS OF INTEREST.

THE SECRETARY OF THE NAVY.

WASHINGTON.

July 27, 1917.

My Dear Sir:

I have received your letter of July 25th, transmitting to me a copy of the Resolutions recently adopted by the Society for the Promotion of Engineering Education, and I thank you for sending them to me. The question of the withdrawal of large numbers of undergraduates from our engineering and medical schools for enlistment in the Army is, of course, a very serious one, and one which I am sure will have most careful consideration.

Sincerely yours,

JOSEPHUS DANIELS.

Mr. F. L. Bishop, Secretary,
Society for the Promotion of Engineering Education,
Pittsburgh, Pennsylvania.

UNITED STATES NAVAL ACADEMY, ANNAPOLIS, MARYLAND, DEPARTMENT OF MARINE ENGINEERING AND NAVAL CONSTRUCTION.

July 13, 1917.

My dear Dr. Bishop:

I want to express my appreciation of the excellent professional opportunity which came to me as a delegate to the Washington meeting of the Society for the Promotion of Engineering Education. Not only was the time spent in a valuable manner but in an enjoyable way.

I trust we shall have the pleasure of seeing you at Annapolis again and I know that you will be interested in hearing that steps are now being taken looking toward the con-

struction of an excellent building for the Post Graduate School as recommended last year by your Society.

With kindest regards, I am,

Yours very truly,

W. T. CLUVERIUS,
Commander, U. S. Navy.

Professor L. H. Harris, Assistant Secretary of the Society, who has been for some time Captain in the Engineer Officers' Reserve Corps, was called for active duty in August and is now in the Constructing Quartermaster's Department.

Due to the possible decrease in the membership and the income from dues on account of the war, the Executive Committee upon the recommendation of the Secretary has decided that the Secretary should not appoint an Assistant Secretary for the present year.

The Proceedings of the twenty-fifth meeting of this Society went to press in September and should be in the hands of all members who have paid their dues at this time. Great effort was made to get this out early because it was believed that the result of the meeting would be of benefit to the institutions at the opening of the school year.

In pursuance of the request of the institutional delegates at the Washington meeting, Commissioner Godfrey of the Advisory Commission of the Council of National Defense appointed the following committee: C. S. Howe, President, Case School of Applied Science; Milo S. Ketchum, Dean of Engineering, University of Colorado and president of this society; C. R. Mann, Carnegie Foundation for the Advancement of Science; S. P. Capen, Specialist in Higher Education, Bureau of Education; and F. L. Bishop, Dean of Engineering, University of Pittsburgh and secretary of this society, chairman. This committee is making a study of the relation of engineering schools to the national government during the present emergency. A preliminary report appears elsewhere in this

number of ENGINEERING EDUCATION and a comprehensive report will be issued some time in October.

The various educational activities of the Advisory Commission of the Council of National Defense and war activities of the Bureau of Education have been combined in a coördinating executive committee made up of the following men: President Goodnow, Johns Hopkins University, chairman, representing the universities; President Pearson, Iowa State College, representing the land grant colleges; President Ferry, Hamilton College, representing the colleges of Liberal Arts; Dean F. L. Bishop, University of Pittsburgh, representing the engineering schools; and S. P. Capen, Bureau of Education, representing the Bureau of Education and the Executive Secretary of the Committee.

EDITORIAL.

We naturally expect that many changes will be evolved in education, particularly in engineering education, as a result of the present war. This has already demonstrated itself in many ways and the Committee on Engineering and Education of the Council of National Defense will have considerable to say in regard to this matter in its final report. But one very striking development is the commercial advertising of engineering education which was begun under a committee consisting of F. W. McNair, G. F. Swain, C. S. Howe, F. E. Turneaure, G. C. Anthony and M. S. Ketchum.

The editor believes that many young men in this country would attend institutions of higher learning and especially engineering schools, if these schools were brought to their attention in a concrete and concise way. It is remarkable that many young men in high school have no opportunity of becoming familiar with the aims and objects of engineering schools. Take, for instance, an ordinary high school in the city. All the teachers with the possible exception of those in manual training and physics are graduates of colleges of Lib-

eral Arts where the training is such that they themselves have no possible conception of what the engineering profession is. It is practically impossible for the young men even in high schools to obtain such information. This is one reason why I believe it very desirable especially at this time of rapid development in engineering application not only to war but to industries, that the needs of the nation be brought to the attention of the young man by means of daily papers and magazines with which he comes in contact. Many schools heretofore have maintained advertisements to a greater or less extent in certain technical journals. These, of course, were excellent but how many high school students read high-grade technical journals? We should bear in mind in this connection that it is the young men largely who determine in this country where they are to go to school. Theoretically the parent does, but practically, it is left to the young man.

It seems to me that only good can result from this kind of a campaign. We must expect that it will be criticized; that some men who call themselves engineers will disapprove of it and some editors will undoubtedly find it a fruitful source of editorials. It, however, is right and will result in good to the nation and to the young men.

THE PROCEEDINGS HAVE BEEN ISSUED EARLY. THEY MUST BE PAID FOR FROM CURRENT DUES. IF YOU HAVE NOT PAID YOUR DUES FOR THIS YEAR, PLEASE SEND CHECK FOR $4.00 TO MR. W. O. WILEY, TREASURER, 432 FOURTH AVENUE, NEW YORK CITY.

COLLEGE NOTES.

University of Florida.—The State Road Department, which was established by the Legislature of 1915 with headquarters at Tallahassee, has established a branch office at the College

of Engineering of the University of Florida. Besides serving as headquarters for work of the department through eastern and southern Florida this branch office will also have charge of all the testing of road materials done by the State Road Department. For this purpose the testing equipment belonging to the College of Engineering will be used, and for the further development of the testing laboratory the State Road Department and the College of Engineering will combine their efforts.

When the State Road Department was first established, every effort was made to have its headquarters placed at the College of Engineering of the university, and this was recommended to the legislature by the Florida State Good Roads Association; but the legislature saw fit to place the headquarters at the state capital. Now that the department has been established it has become so apparent that the facilities of the university would be of advantage to it that a branch has been established as noted.

Lafayette College.—Almon H. Fuller, dean of the School of Engineering at the University of Seattle, Washington, and one of the national leaders in engineering education, has accepted the appointment to the Head of the Department of Civil Engineering at Lafayette College which was vacated in June by the resignation of Professor J. Madison Porter. Professor Fuller will be supported by the same corps of assistants as Professor Porter had. Dean Fuller was selected for the post at Lafayette by a committee of alumni headed by Carroll P. Bassett, a well known engineer of Summit, N. J., and with him James Gayley of New York City, E. J. Fox, Esq., of Easton, Abraham Hogeland, chief engineer of the Great Northern Railroad, and Horace C. Booz, chief construction engineer of the Pennsylvania Railroad.

Dean Fuller is a graduate of Lafayette College. After his graduation he took post-graduate work at Cornell University as the McGraw Fellow in Civil Engineering. In 1899 he became professor of civil engineering at Washington Univer-

sity. One year later he was made dean of the department and since that time, through his efforts, this department has taken a place in the foremost ranks of the engineering schools of the country. Professor J. Madison Porter entered the Lafayette faculty in 1887 as an instructor in civil engineering. In 1890 he became full professor and headed the department. Through the twenty-seven years of his connection the civil engineering department at Lafayette College has become celebrated throughout the technical world. During the interim since the resignation of Professor Porter, Professor Harry T. Spengler has been acting head of the department. The other members of the faculty in civil engineering who assisted Professor Porter and who will remain in the department under Professor Fuller are Professor William T. Lyle, professor of municipal engineering; Professor Otho M. Graves, professor of graphics; Clifford E. Williams, instructor in cement engineering, Robert S. Johnson, instructor in civil engineering.

Donald B. Prentice, of the Sheffield Scientific School, of Yale University, has been appointed assistant professor of mechanical engineering at Lafayette, and has accepted the appointment. Professor Prentice will take charge of the work in boilers and heat engineering hitherto cared for by Professor Fitch.

Mr. Prentice graduated from Yale in 1910, and has been connected with the department at Yale since 1912. Mr. Prentice is married and will move to Easton and take charge of the work at once.

A. & M. College of Texas.—James C. Nagle has been appointed dean of engineering and professor of civil engineering in the Agricultural and Mechanical College of Texas, succeeding D. W. Spence, whose death occurred in June.

Mr. Nagle is a Virginian by birth, but most of his life has been spent in Texas. He graduated from the University of Texas in 1889 with a B.S. degree in engineering, and obtained an M.A. degree in 1892. In the same year he obtained a C.E.

degree from the Western University of Pennsylvania, now the University of Pittsburgh, and in 1893 an M.C.E. degree from Cornell.

He was a professor of civil engineering in the Agricultural and Mechanical College of Texas for about twenty years, and in 1911 was also made dean of engineering. He resigned from this position in 1913 to become chairman of the Texas board of water engineers, and has occupied that position since then. During his professional career he has often been engaged on construction work of various kinds, principally railroad, bridge and irrigation work.

Mr. Nagle is the author of a field manual for railroad engineers and of numerous technical papers. He is a past president of the Texas Association of Members of the American Society of Civil Engineers; past president of the Texas Academy of Science and a major in the Engineers' Reserve Corps.

B. K. Coghlan has resigned as associate professor of highway engineering at the Agricultural and Mechanical College of Texas. He is captain in the Engineer Officers' Reserve Corps and has been ordered to Ft. Leavenworth.

E. O. Francisco, who was assistant professor of civil engineering at the Agricultural and Mechanical College of Texas during the last session, has been commissioned a second lieutenant in the Engineer Officers' Reserve Corps and has been ordered to Ft. Leavenworth.

PERSONALS.

Professor A. M. Buck, who for the past six years has been in charge of the electric railway courses at the University of Illinois, has resigned to join Mr. John A. Beeler of 52 Vanderbilt Avenue, New York City. His new work will consist largely of investigations dealing with the construction, operating, and management of electric railway properties. At present he is assisting Mr. Beeler in reporting on the operations of the Boston Elevated Railway to determine if the net reve-

nue can be increased by the addition of operating economies. This work is being done for the Public Service Commission of Massachusetts in compliance with an act passed at the last session of the legislature.

Professor W. S. Franklin, formerly of Lehigh University, has accepted a position as Special Teacher and Lecturer at the Massachusetts Institute of Technology, partly in the Department of Physics and partly in the Department of Electrical Engineering. Professor Franklin requests his numerous correspondents to note his new address.

COPY.

August 31, 1917.

From: The Adjutant General of the Army.
To: The Commanding General, 76th Division, National Army, Camp Devens, Ayer, Massachusetts.
Subject: Assignment of drafted men to organization.

A careful study will be made of the abilities of the men of your command who have been drafted into the service with a view to ascertaining special qualifications for duty in the different branches of the service; and drafted men who have graduated from, or been students in scientific or technical departments of colleges or universities should be assigned to the branches of the service for which their previous training qualified them.

By order of the Secretary of War:

(JOHN S. JOHNSTON)
Adjutant General.

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